at1119paper: Complete the Square, $b = $ odd (v0)

Example

By completing the square, find both solutions to the given equation:

$$x^2 - 59x = -660$$

Add $\left(\frac{-59}{2}\right)^2$, which equals $\frac{3481}{4}$, to both sides of the equation.

$$x^2 - 59x + \frac{3481}{4} = \frac{841}{4}$$

Factor the left side.

$$\left(x + \frac{-59}{2}\right)^2 = \frac{841}{4}$$

Undo the squaring.

$$x + \frac{-59}{2} = \frac{-29}{2} \qquad \text{or} \qquad x + \frac{-59}{2} = \frac{29}{2}$$
$$x = \frac{59 - 29}{2} \qquad \text{or} \qquad x = \frac{59 + 29}{2}$$
$$x = 15 \qquad \text{or} \qquad x = 44$$

Question 1

By completing the square, find both solutions to the given equation:

$$x^2 - 47x = 1340$$

$$x^2 - 47x + \frac{2209}{4} = \frac{7569}{4}$$

$$\left(x + \frac{-47}{2}\right)^2 = \frac{7569}{4}$$

$$x + \frac{-47}{2} = \frac{-87}{2} \qquad \text{or} \qquad x + \frac{-47}{2} = \frac{87}{2}$$
$$x = \frac{47 - 87}{2} \qquad \text{or} \qquad x = \frac{47 + 87}{2}$$
$$x = -20 \qquad \text{or} \qquad x = 67$$

Question 2

By completing the square, find both solutions to the given equation:

$$x^2 - 17x = 390$$

$$x^2 - 17x + \frac{289}{4} = \frac{1849}{4}$$

$$\left(x + \frac{-17}{2}\right)^2 = \frac{1849}{4}$$

$$x + \frac{-17}{2} = \frac{-43}{2} \qquad \text{or} \qquad x + \frac{-17}{2} = \frac{43}{2}$$

$$x = \frac{17 - 43}{2} \qquad \text{or} \qquad x = \frac{17 + 43}{2}$$

$$x = -13 \qquad \text{or} \qquad x = 30$$

Question 3

By completing the square, find both solutions to the given equation:

$$x^2 - 27x = -162$$

$$x^2 - 27x + \frac{729}{4} = \frac{81}{4}$$

$$\left(x + \frac{-27}{2}\right)^2 = \frac{81}{4}$$

$$x + \frac{-27}{2} = \frac{-9}{2} \qquad \text{or} \qquad x + \frac{-27}{2} = \frac{9}{2}$$

$$x = \frac{27 - 9}{2} \qquad \text{or} \qquad x = \frac{27 + 9}{2}$$

$$x = 9 \qquad \text{or} \qquad x = 18$$

Question 4

By completing the square, find both solutions to the given equation:

$$x^2 + 53x \;=\; -700$$

$$x^2 + 53x + \frac{2809}{4} \;=\; \frac{9}{4}$$

$$\left(x + \frac{53}{2}\right)^2 \;=\; \frac{9}{4}$$

$$x + \frac{53}{2} = \frac{-3}{2} \qquad\qquad \text{or} \qquad\qquad x + \frac{53}{2} = \frac{3}{2}$$

$$x = \frac{-53 - 3}{2} \qquad\qquad \text{or} \qquad\qquad x = \frac{-53 + 3}{2}$$

$$x = -28 \qquad\qquad\qquad \text{or} \qquad\qquad\qquad x = -25$$